Brit. Heart J., 1968, **30**, 869.

Proceedings of The British Cardiac Society

THE FORTY-SEVENTH ANNUAL GENERAL MEETING of the British Cardiac Society was held in the Donnan Laboratories of Inorganic Chemistry, University of Liverpool, on Thursday, April 18, 1968. The President, SHIRLEY SMITH, took the Chair at 9.00 a.m. during Private Business before handing over to the Chairman, WYN JONES.

PRIVATE BUSINESS

1. The Minutes of the Annual General Meeting having been published in the Journal (1967, **29**, 937) were taken as read and confirmed.
2. The Treasurer reported that the General Fund Investments stood at £529.2.0. The cash at bank was £1573.4.7, of which £1000 was on deposit and £600 was earmarked for payment for the Journal.

   The expenses showed an over-all decrease on 1967. Meetings cost £41 less, secretarial expenses were down by £12, printing and stationery by £30, and general expenses by £56. The net result was an increase in the excess of income over expenditure of £187 as compared with 1967.

   The Treasurer showed a graph to illustrate these points and expressed his thanks to members of the Society for their cooperation in reducing the expenses.

   Council had agreed to donate £50 to the Society of Cardiological Technicians, and to pay £200 to £400 from the General Fund into the Congress Fund, the exact amount to be left to the discretion of the Treasurer.

   The Congress Fund stood at £1275.19.3: £732.18.4 being invested, and £527 in the bank, representing an increase of £266 over the year.

   The Thomas Lewis Lecture Fund Investments remained the same at £1173.10.2 with £6.3.7 at the bank and £8.14.2 due for Income Tax repayment. The Third Lecture on November 2, 1967, was paid for entirely out of the Fund, the expenses amounting to £119.16.8.
3. Emanuel was elected *Secretary* of the Society.
4. Hamer was elected *Assistant Secretary* of the Society.
5. The following two new *Members of Council* were elected in place of Gavey and Jackson:

   Whitaker and Davison
6. The following *Extra-Ordinary Members* were elected:

   Mason Steen Wayne
7. The following *Corresponding Member* was elected:

   Harald Eliasch of Sweden.
8. The following *Ordinary Members* were elected from Associate Membership:

Aber	Abrams
Farmer	Goldberg
Griffin	Gunning
Leveaux	McGuinness
Makey	Owen
Pentecost	Portal
J. R. Rees	B. F. Robinson
J. Robinson	Sowton
J. G. Stevenson	

   and as new Members:

John Dickson Dow	London
Elanor Zaimis	London

9. The following *Associate Members* were elected:

Colin Bray	London
Neville Conway	London
James Samuel Fleming	London
Stephen C. Jordan	Bristol
William F. W. E. Logan	Manchester
Harold Gordon Mather	Bristol
Robert Emerson Nagle	Birmingham
George C. Patterson	Belfast
D. J. Rowlands	Manchester
Gerald Sandler	Sheffield
William Urquhart	Newcastle-upon-Tyne

   and as *Associate Surgical Members*—

Harold Frank McGhie Bassett	Manchester
Ary Blesovsky	Newcastle-upon-Tyne
Stuart Craig Lennox	London
Marvin Francis Sturridge	London

10. The following *Overseas Members* were elected:

A. G. Shaper	Uganda
Krishna Somers	Uganda

    and the following re-elected—

    Davidson, Harries, Parry, and Wilson.
11. The Secretary reported that plans for the VI World Congress were well advanced and that the meeting would be held from September 6–12, 1970, in the Royal Festival Hall complex. Members would be informed from time to time of the details of the organization and of the scientific programme.
12. The V European Congress of Cardiology will be held in Athens from September 8 to 14, 1968.
13. The IV Asian Pacific Congress of Cardiology will be held in Tel-Aviv from September 1 to 7, 1968.

14. The Autumn Meeting of the Society will be held on December 5 and 6, 1968, at the Royal College of Physicians.
15. The Annual General Meeting of the Society in 1969 will be held in Aberdeen, the exact date to be confirmed.
16. The Secretary reported that several Members were dissatisfied with the catering arrangements at the Royal College of Physicians, but drew attention to the fact that as long as meetings were held there we had no option but to use the College caterers—Ring and Brymer. He added that a personal approach would be made to the caterers prior to the Autumn Meeting.
17. *Demonstrations* were held at the Donnan Laboratories.

The Society dined together at the Adelphi Hotel, the principal guests being the Pro-Vice Chancellor of the University, the Registrar of the University, the Dean of the Faculty of Medicine, the Senior Administrative Medical Officer of the Liverpool Regional Hospital Board, and the President of the Cardiological Society of India. The President, Shirley Smith, proposed the health of Wyn Jones, the Chairman of the Scientific Meeting, and Wyn Jones replied.

Electrocardiographic Triad of High Lateral Infarction

By E. Fletcher, and P. Morton and G. Murtagh (*both introduced*)

The electrocardiographic triad, $T_1 < T_3$, TaVL negative, and high TaVF, and abnormal high chest leads, is an important indication of small areas of myocardial infarction located at the base of the ventricular muscle. The topography of high infarction has been demonstrated at necropsy. Usually, however, they have a benign clinical course, and their recognition depends upon diagnostic changes in unipolar leads recorded at a higher level than the conventional locations. In this study, locations in the third intercostal space have been used. The changes in the chest leads depend upon the "Q" area and "T" area distribution on the surface of the chest in relation to the site of the infarction, and these changes are independent of the mathematical relation between the various components of the limb leads in the frontal plane. The reciprocal T wave changes, indicative of high infarction, are directly related to the wide QRS/T axis angle. The relative height of the R deflection in leads I and III has to be taken into account. When they are present high chest leads should be recorded. High infarctions are estimated to account for about 10 per cent of all infarctions. Usually the patient has a normal heart on ordinary clinical examination. Their presence is apt to be overlooked in routine tracings unless the observer is aware of the significance of $T_1 < T_3$, TaVL negative, and high TaVF in the presence of a normal praecordial electrocardiogram, and records additional exploratory leads higher on the chest wall.

The "A" Wave of the Apexcardiogram in Aortic Valve Disease and Cardiomyopathy

By E. J. Epstein, N. Coulshed, and A. K. Brown and N. G. Doukas (*both introduced*)

(Published in full in *Brit. Heart J.* (1968), **30**, 591.)

Blood Volume Changes after Myocardial Infarction

By J. M. Clarke, T. Deegan (*both introduced*), and C. S. McKendrick

Blood volume was studied in 52 patients on the first 3 days after myocardial infarction and during the recovery period. On admission, patients were graded according to a prognostic index, and 33 patients with 3 daily studies were divided into 23 with and 10 without left ventricular failure.

^{131}I-labelled human serum albumin was used as the indicator, and the activity of the plasma samples was determined using a well-type scintillation counter.

To assess the reproducibility of the technique, duplicate blood volumes were determined on 25 controls. The "normal" blood volume of each patient was predicted from a nomogram which took into account height, weight, and fat thickness. A blood volume ratio was calculated as the patient's predicted blood volume divided by the observed blood volume.

The results showed an individual variable response. However, on the first day all patients showed a mean ratio characteristic of a reduced blood volume ($1{\cdot}09 \pm 0{\cdot}19$), whereas patients with left ventricular failure showed an over-all picture of an expanded blood volume ($1{\cdot}00 \pm 0{\cdot}25$) which was reduced after the second day. Three patients with irreversible shock had abnormally high blood volume ratios, indicating that effective blood volume was considerably reduced. In 40 survivors, blood volume during the recovery period was similar to predicted blood volume.

Use of Atrial Pacing to Evaluate Drugs in Angina Pectoris

By R. Balcon, J. Hoy, W. Maloy, and E. Sowton

Atrial pacing to increase the heart rate in a controlled fashion can be used in the evaluation of patients with angina pectoris as a safe and simple substitute for an exercise test. In most patients angina occurs at the same level of tension-time index, whether this is produced by pacing or by exercise. Measurements of this threshold level can be repeated within 5 per cent apart from alterations related to changes in ventricular volume. The threshold measurements correlate well with clinical state in patients treated by drugs or surgical revascularization of the myocardium.

After 0·6 mg. nitroglycerine sublingually patients could be paced to higher rates without the production

of pain. The beneficial effects were due to reductions in aortic pressure, venous pressure, and probably in ventricular end-diastolic volume also.

Fifty patients have been studied, often on more than one occasion. There have been no complications apart from slight local bruising, and the technique is suitable for use on out-patients.

Controlled Trial of Hypotensive Agents in Hypertension in Pregnancy

By P. A. Baker, M. A. Chadd, D. Michael Humphreys (*all introduced*), and H. M. Leather

A series of 106 hypertensive pregnant patients (diastolic pressure 90 mm. Hg and over) were grouped as (1) those with hypertension before (20/40) and (2) those who developed hypertension after (20/40).

There were 52 controls (sedation only) and 54 treated patients (methyldopa and bendrofluazide). Controls and treated patients were similar in respect of age, parity, family history of hypertension, and proteinuria, and findings on intravenous pyelography subsequent to pregnancy were similar in both groups.

Average fall in diastolic pressure in controls was 6·7 mm. (to 94 mm. Hg) and in treated patients 14·5 mm. (to 85 mm. Hg). Effect of treatment on length of gestation, birthweight, stillbirth, and neonatal mortality, condition of baby, state of placenta, and of maternal renal function and maternal hypertension rate after pregnancy, were assessed.

The results are set out in the Table.

		Controls	Treated
Average length of gestation (wk.)	Group 1	36/40	37·5/40
	„ 2	36/40	36/40
Birthweight (g.)	„ 1	2578	2864
	„ 2	2325	2268
Stillbirths and neonatal deaths	„ 1	6	1
	„ 2	5	8
Condition at birth	Good	33	30
	Poor	12	10
Placental weight (g.)	Group 1	549	563·5
	„ 2	506·5	473
Placental infarction		26	28
Persisting blood pressure + after pregnancy (Groups 1 and 2)	at 6/12	47%	60%
	at 12/12	42%	56%
	at 2 years	No difference	
Maternal creatinine clearance (ml./min.), post-partum	120+	17	7
	100–119	9	17
	80–99	7	8
	60–79	3	6
	−60	1	2

In patients hypertensive before 20/40, treatment with hypotensive agents reduced the stillbirth and neonatal mortality rate as compared with controls. The pregnancies lasted longer, the babies were slightly heavier, and the placentas were slightly heavier. No other differences were observed. In patients developing hypertension after 20/40, such treatment was of no apparent advantage to mother or child. There was no evidence that such treatment was harmful to mother or child.

The incidence of impairment of renal function (creatinine clearance < 100 ml./min.) was the same in treated and control groups. Residual hypertension, likewise, persisted equally in both groups.

Plasma Levels and Tissue Distribution of ^{3}H-Digoxin

By P. F. Binnion and L. M. Morgan (*both introduced by E. Fletcher*)

Dogs anaesthetized with sodium pentobarbitone were given 0·8 mg. digoxin (approx. 100 μCi) intravenously, and blood samples were collected for one hour and then tissues were removed for analysis. The wet weights of the organs were measured and a smaller sample of tissue was prepared for liquid scintillation counting (tissues and plasma were digested with hyamine hydroxide at 50°C. overnight; the liquid scintillator was a mixture of PPO and POPOP in toluene; 1 ml. ethyl alcohol was added to the final solution to prevent phase separation).

^{3}H-digoxin disappeared from the circulation in two phases, one rapid, with an average half-life of 2·6 min., while the slow phase had a half-life of 26·6 min. (the former represents distribution of digoxin in the body, while the latter is due to excretion of the material). When plasma potassium was raised acutely by intravenous infusion of KCl from an average normal level of 3·8 mEq/l. to an average of 6·5 mEq/l., there was no change in the half-life of the rapid phase, but the biological half-life was decreased (average 18·5 min.).

Tissue analysis showed a large excretion of ^{3}H in the urine compared with the bile (approximately 17 times greater excretion in urine compared with bile). The myocardial concentration (average for left and right ventricles) of ^{3}H was almost five times greater than that in skeletal muscle, and this observation is the subject of current investigation.

Handling of Plasma Lipoprotein Lipase by Heart and Lungs

By John R. Muir (*introduced by Peter Harris*)

The arteriovenous differences in plasma lipoprotein lipase across the lungs and the myocardium have been measured in a group of patients both before and after the intravenous injection of heparin during cardiac catheterization. Significant preheparin lipolytic activity, due to the presence of lipoprotein lipase, was found in the pulmonary arterial plasma of 8 out of 13 patients, and in the brachial arterial plasma in 7 out of 25.

In the absence of exogenous heparin, there is a significant uptake of lipoprotein lipase by the lungs, which increases considerably after the injection of heparin. After the intravenous injection of heparin, there was a rapid release of lipoprotein lipase from the myocardium and the uptake of the enzyme by the lungs increased significantly.

There was a positive correlation between both the preheparin systemic and pulmonary arterial lipolytic activity and the pulmonary arterial pressure, but no correlation between the uptake of the enzymes by the lungs and the pulmonary pressure.

The implications of these observations were discussed, and in particular their bearing on intravascular hydrolysis of triglycerides.

Haemodynamic Changes following Angiography

By A. K. Brown, J. M. Clarke (*both introduced*), N. Coulshed, N. G. Doukas (*introduced*), and E. J. Epstein

Serial physiological and haemodynamic studies were made in 133 patients before and for 20 minutes after left angiography with Hypaque. *Measurements* recorded were: left heart pressure in 133, haematocrit in 35, blood volume in 17, and cardiac output in 10 patients. Diagnoses were: normal, 7; mitral stenosis, 18; mitral regurgitation, 30; combined mitral stenosis and mitral regurgitation, 18; aortic stenosis, 19; aortic regurgitation, 23; cardiomyopathy, 18.

Changes were maximal 1 to 3 minutes after angiography and returned to normal within 20 minutes. Haematocrit fell (−11%), blood volume rose (+14%), and heart rate (+18%), stroke volume (+25%), and cardiac output (+43%) increased. Haemodynamic responses were unrelated to injection site.

Patients with mitral stenosis showed increased mean and end-diastolic mitral valve gradients without rise of left ventricular end-diastolic pressure. The increased gradient correlated well with severity of stenosis. Raised left ventricular end-diastolic pressure in patients with mitral valve disease implied significant mitral regurgitation or associated left ventricular disease.

In severe aortic stenosis rises in left ventricular end-diastolic pressure followed angiography. The latter often remained normal after angiography in severe aortic regurgitation. All cardiomyopathy patients showed post-angiographic rises in left ventricular end-diastolic pressure. In 7 of 18 studied, left ventricular end-diastolic pressure only became abnormal after angiography and provided evidence of left ventricular dysfunction.

Post-angiographic changes are similar to those after exercise and help in assessing left ventricular function. Because of the circulatory changes, successive angiograms should be delayed 15 minutes.

Effect of Isoprenaline and Propranolol on Calcium Uptake of Sarcoplasmic Reticulum from Dog's Heart

By M. Hess, E. Shinebourne, N. Briggs (*all introduced*), and J. Hamer

Isolated granules of sarcoplasmic reticulum have been shown to take up calcium actively, and it is postulated that release of calcium from the reticulum is responsible for the initiation of myocardial contraction. The activity of the granules from the failing heart is decreased and the effect is reversed by digitalis. In view of these findings we have investigated the effects of isoprenaline and propranolol to see whether the inotropic actions of the sympathetic nervous system were also mediated by changes in the calcium uptake of the sarcoplasmic reticulum.

Sarcoplasmic reticulum was prepared from 12 fresh dog hearts by differential centrifugation. The uptake of calcium was assessed by a radioisotopic method and the effects of the drugs on the rate of uptake were studied. Isoprenaline was found to increase the uptake significantly, and the effect was prevented by propranolol, which when used alone produced a decrease in calcium uptake.

These findings indicate a new mode of action of the sympathetic nervous system at a cellular level. The increase in contractility produced by sympathetic stimulation may be due to an increase in the calcium content of the sarcoplasmic reticulum leading to a greater release of calcium when the cell is stimulated. It seems likely that all inotropic effects on the heart muscle are produced by an increase in the amount of calcium released to initiate contraction.

Anatomical Aspects of Transposition of Great Vessels

By Krzysztof Lubkiewicz (*introduced*) and R. S. Jones

The treatment of transposition of the great vessels by the Rashkind procedure and the Mustard operation has become relatively well defined from a technical point of view. However, the more complex group of transpositions, for example with abnormal septation resulting in a septal defect and obstruction to blood flow, present much more difficult technical problems. To solve these it is necessary to understand the embryological and anatomical causes of the haemodynamic abnormalities.

The anatomy of the outflow tract in D-transposition was described from the developmental point of view, and the therapeutic implications were discussed.

Method for Recording Electrocardiographic Waveform Changes Continuously

By J. M. M. Neilson and C. T. M. Davies (*both introduced*), and A. H. Kitchin

A computer has been designed to produce a continuous record of the deviations of selected points on a changing electrocardiographic complex referred to a chosen isoelectric point. The instrument can operate directly on the output of an electrocardiogram amplifier.

The method has been applied to the analysis of the electrocardiogram (lead CR5) of 30 normal men, aged 20–25, recorded at rest and during 5-minute periods at two levels of treadmill exercise (average heart rates 124 and 165 beats per min.). Using a reference point 50

msec. before the R wave, the voltages of 9 points on the S–T segment and T wave were recorded throughout the stages of rest, exercise, and recovery.

During mild exercise immediate S–T depression ($< 100\ \mu$ volts) occurred in 13 subjects. With increased exercise two patterns developed, either increasing S–T depression or S–T elevation. The main T wave changes occurred after stopping exercise when T waves of large amplitude developed. ST–T changes were related partly to heart rate but more to the stage of the exercise and recovery, and plots of voltage against heart rate showed marked hysteresis loops.

The physiological significance of these changes and results obtained in patients with ischaemic heart disease were discussed.

Clinical Use of I.C.I. 50172 in Supraventricular Tachycardia

By D. Gibson (*introduced*) and E. Sowton

The new drug, I.C.I. 50172, has been shown to reduce the heart rate both at rest and on exercise. Unlike propranolol, it does not cause a drop in cardiac output, as there is a reciprocal increase in stroke volume.

The drug was given intravenously to a number of patients whose clinical state appeared to have deteriorated due to a rapid ventricular rate, and in whom the use of propranolol was contraindicated by the presence of heart failure. A dose of 5 mg. was effective in reducing the ventricular rate in uncontrolled atrial fibrillation, and in 2 patients atrial tachycardia reverted to sinus rhythm. The response usually occurred within one circulation time of injection of the drug, and was unaffected by the degree of digitalization or the presence of hypokalaemia. A single dose was effective for about 30 minutes, but the ventricular rate could be controlled for longer periods by infusing 20 mg. over 24 hours.

In most instances, use of the drug was followed by rapid clinical improvement. In no case was heart failure aggravated, even when the dysrhythmia was not controlled. No significant side-effects were encountered.

Part Played by Bradycardia in Action of Propranolol

By John Hamer, James Fleming, and Elliot Shinebourne (*introduced*)

Beta-adrenergic blockade has been shown to reduce myocardial contractility, but also leads to a fall in heart rate. Bradycardia is, in itself, associated with a diminution in myocardial contractility, and it is difficult to be certain of a direct action of beta-adrenergic blocking drugs on the heart muscle under these circumstances. We have examined two situations in which the effects of beta-adrenergic blockade on the heart rate have been eliminated.

Comparison of data obtained at similar heart rates during exercise studies in patients with hypertension before and after propranolol show that, in spite of the greater work load after the drug, the cardiac output and stroke volume are unaltered. A decrease in ejection rate after propranolol indicates that myocardial contractility has been reduced. Direct measurement of ventricular wall force and velocity of contraction by the thermodilution method in patients with aortic stenosis shows a tendency to a reduction in contractility after beta-adrenergic blockade when the fall in heart rate is prevented by giving propranolol and atropine together.

These findings indicate that part of the reduction in contractility produced by propranolol is due to the fall in heart rate produced by the drug, but there is also evidence of a direct negative inotropic effect on the heart muscle.

Significance of Aortic Regurgitation after Homograft Replacement of Aortic Valve

By Alastair McDonald (*introduced*), Lawson McDonald, and Donald Ross

Before the end of 1966, 109 patients were discharged from hospital after insertion of a homograft valve. Of these patients, 86 are leading normal lives, and 9 have died; 60 per cent of 100 surviving patients have an immediate diastolic murmur due to aortic regurgitation. In 47 there are no peripheral signs of aortic regurgitation; aortography has shown the regurgitation to be trivial in them and repeated clinical examination has shown it to be non-progressive. Of the 13 patients with peripheral signs of regurgitation, 3 have had successful further operations, and 4 await further surgery. The remaining 6 patients, with significant aortic regurgitation, are well on medical treatment. Details of the time of onset of aortic regurgitation, and its cause, have been studied. Of the 9 patients who died after leaving hospital, 3 had infective endocarditis, 2 had cardiac infarction, 1 died after prosthetic replacement of the mitral valve, and 3 had heart failure. Of the 3 with heart failure and aortic regurgitation, 2 died after further aortic operations at 12 and 27 months, and one at 7 months with an intercurrent illness. These findings were discussed in relation to the surgical management of aortic valvar disease.

Mode of Production of Left Ventricular Third Heart Sound

By James Fleming

The third heart sound of left ventricular failure or of mitral incompetence is often referred to as a left ventricular filling sound. The sound is heard at the time of maximal rate of filling of the left ventricle, and has been attributed by some workers to a sudden rapid distension of the ventricular wall. Recently, a valvar mechanism for the production of the third heart sound has been considered more likely; it is suggested that during the rapid ventricular filling phase the left ventricle elongates until the mitral valve leaflets are drawn

taut by the papillary muscles, chordae tendineae, and valve ring.

In the present study the apex cardiogram and phonocardiogram were recorded in 16 patients with mitral incompetence before and up to six months after mitral valve replacement with a Starr-Edwards prosthetic valve. Before operation a third sound was present in all patients and corresponded exactly with the peak of the rapid filling wave on the apex cardiogram. After mitral valve replacement a third heart sound was no longer present, and no peak to the rapid filling phase could be recorded in the apex cardiogram. In contrast, a third heart sound and a corresponding peak on the apex cardiogram could frequently be recorded in patients where aortic valve replacement had been undertaken, leaving the mitral valve mechanism intact.

These findings suggest that the left ventricular third heart sound arises from the mitral valve.

Free Noradrenaline in Plasma of Patients after Cardiac Infarction

By Colin Bray, and Carole Baker and Norma Restieaux (*both introduced*), and Lawson McDonald

Levels of plasma noradrenaline have been measured in 50 men after cardiac infarction and 50 controls, by the aluminium oxide-trihydroxyindole method, using the modification of Anton and Sayre (1926)*. Blood for analysis was usually taken within 24 hours of admission to hospital. The patients were aged 38–74 years, with average 56. The controls were matched for age. The levels of free noradrenaline in the plasma of the patients were from 0·11 μg./l. to 1·67 μg./l., with a mean of 0·60. In the controls the levels were from an undetectable amount to 0·62 μg./l., with a mean of 0·29. The increase of noradrenaline was significant ($P < 0·001$) in the plasma of the patients after cardiac infarction, compared with the controls. These results were related to clinical and other metabolic findings.

* Anton, A. H., and Sayre, D. F. (1962). *J. Pharmacol. exp. Ther.*, **138**, 360.

Total Anomalous Pulmonary Venous Drainage

By F. R. Edwards

At the Royal Liverpool Children's Hospital, 35 patients with total anomalous pulmonary venous drainage have been studied. Twenty-three were supracardiac in type, with a common vein draining into the left innominate vein. Some views were presented as to whether this vein was a persistent left-sided superior vena cava or a part of the pulmonary venous system.

Eight patients drained into the coronary sinus, 2 into the right atrium, and 2 into the portal system. The diagnostic problems in this group were considerable. Most patients died in the first year of life, but a study of the anatomy showed that many of these might have been saved by a palliative operation, with a fully corrective operation later. The main problem in the early stages is one of foramen ovale obstruction, and relief of this can be obtained by the opening of the fossa ovalis. This can be performed in infants by inserting a splitter through the right atrium into the foramen ovale and splitting the soft tissue of the fossa. This has been performed in 3 patients. Total correction was carried out in 5 patients, and all survived.